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THE PRINCIPLES OF EDUCATION

By Dr. P. G. NUTTING

EDUCATION covers the span of life from the cradle to the grave. Impressions are received in bits and blocks in an endless stream. Some of these pass almost at once into oblivion, leaving the merest trace in our minds. Other impressions, stimulating more or less interest through partial or anticipated connection with something already in our minds, are seized upon, inspected and then, if found true and worthy, tagged and pigeon-holed with other associated impressions. An occasional new impression of unusual strength will dominate a whole group of old impressions.

The mind then makes abstracts (ideas) of groups of impressions to connect with abstracts of other groups. The best measure of mentality is probably this tendency to interconnect and abstract the essential ideas in a wide variety of other ideas and groups of impressions. And mentality in this sense is a measure of the degree of education in an individual.

The impressions of an infant are limited to those received from its immediate surroundings. During school days, the mind receives and assimilates ideas from farther afield not associated with desire or discomfort. Later on, in high school and college days, the mind likes and readily assimilates groups of abstract related ideas and even probes the infinite and unknowable. In middle life, the dominant interest lies in the practical problems of everyday life. The field of our activities is our school and the newspaper and magazine our text-books. The mind demands fresh facts and new ideas. In later life, after the details of most minor problems have become familiar, interest turns once more to general principles and larger problems, details are reduced to routine when possible.

In short, education is as long and as broad as our lives. National welfare requires that it be recognized and treated as such. What we now call education is a mere generalization of parental instruction covering the period of most active interest in the most abstract ideas. Real education in the interest of the nation should be such as to develop and bring into action all the latent possibilities in every individual. Whatever our useful activities at any period of our lives, we should be continually receiving and assimilating new ideas with both bodies and minds fresh and active, with a code of ethics firmly established and a philosophy of life equal to any emergency.

In our present system of education, the responsibility of the nation to the individual is recognized for that part of the individual's mental education which he ordinarily receives from text-books. No attempt is made to instruct him or even to supervise his instruction in later life. He obtains by experience and the experience of others gleaned from chance conversation, from newspapers, magazines and from books such information and ideas as may better fit him or unfit him for his work and his share in the government. The value of knowledge gained in this manner is not to be decried, but it might be made much less casual than it is; the nation might at least see to it that false information and false doctrines are not disseminated and that no inquiring mind goes unsatisfied.

The *physical education* of its citizens has been left almost entirely to chance by nearly all nations, although physical strength and fitness are very important factors in the work of every one. The play and work of their daily lives, together with a casual indulgence in sports on the part of a few, make up the physical training of the masses. Considering its great value to the nation, it would appear advisable to encourage athletic sports, to provide numerous leaders for the specific purpose of encouraging athletic contests and getting all, even the modest, into the fields, golf links and tennis courts. The great value of universal military drill in strengthening the physique of the young adult is beyond question.

For the *moral education* of its citizens, the nation assumes no responsibility whatever. The code of ethics of the average individual is partly instinctive, but largely the product of home influence supplemented by that of one's associates. Various churches and Sunday schools essay the great task of looking after the morals of the public, but reach comparatively few in any vital manner. It must be admitted that their appeal to the public is not very general, partly on account of the nature of the material taught and partly on account of the methods used. The thought of possible punishment or reward in a future life are neither necessary nor sufficient to direct the activities of the average individual.

As a matter of fact, the strongest force influencing behavior is the instinctive desire to attain the respect and esteem of our associates. We know that in an hour we may, by improper conduct, lose the respect which required months or even years to build up and are careful accordingly. By hard experience we obtain knowledge of the safe limits of conduct and by generalization build up codes of morals, ethics and etiquette to govern our actions on future occasions much as a professional man builds up a knowledge of the fundamental principles used in his profession.

The individual who does his best and lives up to his best is sure of the respect of his associates, and since that respect is a criterion for correct behavior it is necessary and sufficient that we strive to attain and retain that respect. Having pleasure and attaining happiness and contentment are by some considered proper and sufficient objectives in behavior, but such motives and criteria are neither necessary nor sufficient in all cases.

Correct education in morals, ethics and manners consists in the formation of codes which, if followed, will lead to the continued and increasing respect of one's fellows. The great school of such education must ever be the complex activities of daily life. The lessons drawn from such activities, the fundamental principles involved, are the vital part of such education. What those lessons and deductions shall be is determined largely by the nature of previous mental reactions to somewhat similar conditions, hence results are strongly cumulative, correct or incorrect deductions are rapidly built into the structure and are difficult to modify later.

As stated, our codes of behavior are chiefly the result of our reactions to conditions of daily life. These are supplemented by lessons drawn from history, from fiction and at the present time, to a considerable extent, from motion-picture drama. Fiction and drama are nominally at least under state and national supervision. It is conceivable to even conservative minds that the nation might well exercise such control as would safeguard the general welfare or might even take steps to promulgate proper ideas and ideals. Possibly teachers of morals and ethics could be provided to conduct schools of morality and ethics for immature minds. The greatest teacher of morals of all times taught largely by parables and this method is second to none. In essence, it is instruction by the study of practical moral problems.

Tendencies in education at the present time are decidedly toward the objectives outlined above. High-school and college curricula are being pruned and modified to eliminate the less desirable in favor of the more useful studies. Those past school age and those whose duties do not permit school attendance are being reached by university extension courses and by correspondence schools. Certain colleges and universities are in favor with certain prospective students on account of the superior opportunities offered in athletics, that is physical education as such is in demand. Technical schools are multiplying in numbers and improving in quality. Universal military training is being seriously considered. However, there has yet been no attempt at systematic general moral education nor any connected effort to instill the principles of industry or morality in our schools. Taking it for granted that such instruction is in the interest of the general welfare, fundamental principles should be worked out and taught by example and the study of practical problems.

The interrelations between mental, physical and moral education and general well being are well known, but rarely taken cognizance of and never made use of for definite ends. An active, healthy, well-trained body is no inconsiderable asset to the intellectual worker and an important factor in good morals. Athletic training and contests make for fair mindedness, patience and the faculty of concentrated effort. The height attained by Greek civilization is in no small measure attributed to the out-of-door life and fondness for athletic sports of the average Greek citizen. The value of sound morals and a sound philosophy of life on the general welfare of individuals and of a nation needs no argument. On the other hand, the value of the average college education to the average citizen is frankly questioned by many and not without reason. The defect in a poor academic education lies in its being a mere accumulation of knowledge; it fails to give that command of fundamental principles that comes only through research and the solution of numerous practical problems. Even the average college education, however, generally leads to a considerably enhanced ability and national tendency to "see straight and think straight," that is it tends to eliminate delusions of all kinds.

A good education results in increased *knowledge, training* and *activity;* along mental, physical and moral lines in its broadest aspect or in some limited field at its narrowest. Many of our great and useful citizens, by unstinted activity and through wide experience in practical problems, have made good in every sense of the word without any academic training. Mere breadth and depth of knowledge is of least avail, teachers and clerks generally are well supplied with it, but without first-hand knowledge of first principles and strong incentives to apply them, never make much progress. However, the gap between academic and industrial life, formerly so wide and deep, is now rapidly narrowing. In many industries college men are preferred as factory superintendents on account of their clearer vision and lack of bias, while on the other hand our universities and scientific societies are coming into closer and closer touch with industry. Many of our best teachers of professional subjects are men who have become experts by practical work. With education at its best, every field of instruction in every institution of higher learning should be dominated by an expert having a thorough command of fundamental principles gained by research or practical work or both.

The Education of the Expert.—The interests of the public and of the nation will be served if all important problems, public as well as private, are in the hands of experts for solution. In administration, legislation, the public health service, agriculture, all branches of engineering, commerce and education, practical problems are continually arising and upon the correct solution of these problems depends the welfare of many individuals and even of the nation itself. The engineer applies fundamental principles to practical problems and to insure progress by the elimination of rule-of-thumb methods requires good engineering practise all along the line. In some fields present practise closely approaches all that it might be, in others almost barbaric incompetence is the rule. Our supply of possible experts is ample, our methods of training them produce good results, although open to much criticism, but our methods of getting the right men into the right places are woefully inadequate and costly.

The older economics recognized two chief factors in industrial welfare, labor and capital. It is now coming to be recognized that there are not two, but three, of these important factors—capital, the trained expert and labor. Without the expert neither capital nor labor can exist to-day for very long in any of the greater industries. He is neither a capitalist nor a mere laborer, but a solver of problems to clear away obstructions and open up new fields of activity. Industries to-day must progress or perish and advances can be made only by the application of organized administrators, engineers, chemists or other professional men. It behooves us therefore to use every effort to improve the quality and increase the number of our trained experts.

Statistics show that genius knows no caste. Men of great achievements originate in all classes in about equal percentages —they can not be bred. If eugenics plays a part, its influence is greatly overshadowed by other factors. Getting the right start and then giving full play to one's bent are the vital factors in developing capacity for great achievement. The right kind of education helps all along the line, in the proper choice of life work, in the preparation for that work and in the development of special ability for advanced work. There are doubtless plenty of individuals capable of very much greater achievement had they but sufficient incentive to overcome their natural modesty, indolence or caution and the proper educational facilities for obtaining the knowledge required and technical skill in its use.

In early youth, before he begins to specialize, probably the best *mental* education for the future expert is not very different from that now generally received in this country, namely, an accumulation of abstract knowledge with training in the three R's. His *physical* education also is probably not subject to much improvement beyond a more universal indulgence in more out-of-door sports and games. But his moral, ethical and *psychical* education falls far short of what it might be. Between the ages of about ten and seventeen he reasons out what is worth striving for in life, forms his code of conduct, and sets up a scale of relative values in possible achievement. At this stage he is very sensitive to external influences, since such influences are strongly cumulative. And for the average youth such influences are of the most casual nature!

A tutor of Peter the Great is said to have formed and crystallized in his youth his purpose to raise Russia from semi-barbarism to civilization, and this he accomplished in the most energetic and single-minded manner in spite of his being deliberately surrounded with pleasures and temptations to wreck his career. It would appear advisable to tell to the young the stories of individuals of great achievement; of Peter of Russia, of Pasteur, of Joan of Arc, Columbus, Franklin and Lincoln, emphasizing the elements of their greatness; their mastering of first principles, their singleness and soundness of purpose, their readiness to attempt the difficult and well-nigh impossible, and their continual hammering away along their chosen lines of activity. In such lessons the moral, ethical and psychic are closely interwoven and the treatment should bring out all three. Nowhere in our schools do we have such teaching, but it is everywhere of vital importance to the general welfare in the education of the future expert. While we are discussing the teaching of the Bible in our public schools we overlook the opportunity of instruction in a field full of the greatest possibilities for national progress.

It is doubtful whether any selection or segregation of specially fit students is advisable before or during the high-school period. No psychologist can select at sixteen just the individuals who will at forty be the most useful citizens in various fields of activity. Some mature early and achieve great results early in life, while others mature slowly and go further. Too early selection and specialization are likely to cost more than they are worth. Up to and through the high-school course the aim should be to give a broad and thorough grounding in the more important branches of academic training, together with a sound physique and a correct, efficient code of behavior.

Following the high school probably the best results are obtained by two years' work at a small college, followed by two years of partly specialized work at a good university with finally two to five years' work in a high-grade graduate or professional school. In all this work the first aim should be to secure a thorough grounding in the fundamental principles of the subject covered. Any profession first attains high standing when the fundamental principles upon which it is based are worked out and formulated. Any professional man can attain high standing in his profession only through a thorough knowledge of the fundamental principles of his profession and the ability to apply those principles.

In the interest of national welfare, mental qualifications alone should be the deciding factor in selection for advanced training. The best of college, university and technical education should be available to students in the humblest circumstances, with free tuition and opportunity for earning living expenses. It is the general impression that students who earn their own way are better represented in proportion among those of great achievement than those supported by their parents. Certainly no one should be excluded or subjected to a heavy handicap because of poverty.

The best of our graduate and technical schools, professional schools, industrial research laboratories and the government departments at Washington offer very nearly ideal training for the future expert in many fields of activity. There is a judicious combination of instruction and practical work under the supervision of capable experts to give the combination of knowledge and technical skill in solving problems required by the specialist. Those contemplating research as a profession should possess a thorough knowledge of the fundamentals in their chosen field, together with demonstrated skill in research. These are attained by well-directed study and research work. The lesser teaching positions in our universities offer excellent facilities for training the future expert; the teaching organizes and hardens his command of fundamentals while graduate study and research advance his knowledge and skill in solving problems.

To provide more and better training for experts, we need (1) more high-grade technical and professional schools, (2) closer relations between the pure research of our universities and industrial research, (3) a broadening of the curricula of our graduate and technical schools to cover fields (such as city administration, illuminating engineering, glass technology, etc.) at present neglected and (4) a central national university of the highest grade to centralize and lead activity in the various fields of professional education and research. It is a hopeful sign that present tendencies are toward all these research ends.

Present methods of training the future expert are open to considerable criticism. The story is told of one of our leading experts in the geology and metallurgy of gold that when the ambition to become such first stirred him he went to Agassiz for instruction. Agassiz gave him a turtle and told him to study it. After several weeks of patient effort he took his results to Agassiz with the statement that he knew all that was to be found out about that turtle and was ready to start the study of gold. He was, however, sent back again and again to his turtle until he knew every detail of its markings, its habits, its appetite, its rate of growth and every movement. Finally, after months of work on the turtle, he was told to go and study gold. The critical period in his career of achievement was that during which he learned how to observe and study. Our higher education is not sufficiently intensive. It is too hurried and lacks definiteness of purpose. Fundamental principles are not emphasized by the teacher nor mastered by the student. Side issues are allowed to divert the attention and break the chain of concentrated effort to completely solve definite problems. These defects are due partly to a national trait of mind, but the proper influence from leaders would do much to correct it.

Although national welfare demands that education should be provided for all and the aim of every individual may properly be that of becoming an expert in some one line of activity, it is by no means to be expected that the yield of specialists will be 100 per cent. There will always be a percentage of partial defectives of all degrees of efficiency. These will always supply the unskilled and the less skilled labor for the rule-of-thumb trades. If universal military service were adopted, not all would be found physically capable of full training, but only cripples would be unfit for some sort of physical training and service. In any case equal opportunities should be provided for all and actual fitness should be the sole deciding factor in determining whether education of any given grade is to be provided for any individual.

Education in middle and later life is chiefly through two channels: increased technical skill through practical work, increased knowledge of fundamental principles through the technical journals. Education in its broader aspect, fitting the individual for his broader duties as a citizen, comes through similar channels, daily intercourse with one's fellows and through reading the newspapers and magazines. It is probably because the human mind has for ages been developed by this dual form of education that similar methods give best results during the student period.

The proper kinds of magazines, scientific journals and newspapers are powerful tools for educating the general public in their various fields of activity. Instead of the present laissez-faire policy of our government, ignoring the fact that such channels of information are powerful factors in general education, it would seem to be in line with general welfare to exercise some supervision over their conduct. Newspaper charlatanism, in which the interest of the individual or of a party has been placed above that of the nation, has worked untold mischief in this country. Inane editorials are the rule rather than the exception. It would doubtless be in the interest of national welfare if editorials were written only by those familiar with the basic principles of national welfare. The nation could well spare all papers run in the interest of individuals, of political machines or any organization that puts its own interests, even in times of peace, above those of the nation.

In the conduct of our scientific and technical journals there is much room for improvement. The best of these are models of their kind, others are run in the interest of the society whose organ they are, regardless of future value as works of reference. At least one journal prints articles in fields as diverse as archaeology, pure mathematics and physiological chemistry. No one reader is interested in perhaps more than a fifth of the matter printed, yet the whole is bound together. There is a great deal of overlapping in some fields while other fields are without any good reference journal. In practically all cases, the individual members of scientific societies are under heavy burdens of expense to maintain their journals. It would seem advisable to see that all fields of science and technology were properly cared for in the interest of general welfare, to the extent of regulation and subsidy if necessary.